Technical Note Regarding Revisions to Historical Data Series on Research and Development

In keeping with the standard objective of economic and indicator reports to improve and update data series, the National Science Foundation (NSF) revised several data series presented in *Science & Engineering Indicators--1996* (*S&EI--96*) from those presented in the previous edition, *Science & Engineering Indicators--1993* (*S&EI--93*). The reader is advised to use the current edition for historical trends as well as for the most recent information.

There have been substantial revisions in the U.S. industry R&D data presented here. Since *S&EI-93*, NSF has instituted annual sampling of industrial firms and increased the sample size from about 14,000 to 24,000 firms in order to produce statistics that more adequately reflect the widening population of R&D performers among firms in the nonmanufacturing industries and small firms in all industries, and to better account for births/deaths of new firms, mergers and acquisitions. Complete details on the new survey methodology for industrial R&D are contained in NSF 95-324, and a summary can be found in NSF 94-317.

Another significant revision was in the data on Federal support for research and development. *S&EI--93* contained preliminary estimates of $65 billion and $68 billion in Federal R&D support for 1992 and 1993, respectively (see Appendix table 4-4, *S&EI--93*). The *S&EI--96* report presents revised estimates of $60 billion for both 1992 and 1993 (see Appendix table 4-4, *S&EI--96*). The rest of this note summarizes the reasons for revising the estimates.

Sources of Data on Federal Support of R&D

The Office of Management (OMB) collects data on Federal agencies support for R&D and R&D plant as part of its annual budget preparation process. In gathering R&D budget authority and outlay data, OMB directs agencies to use the same definitions of R&D that are used for reporting obligation data to NSF's annual R&D surveys of Federal agencies (all defined on page 4-9, *S&EI--96*). Both the NSF and OMB collect data on past year and current year Federal R&D support and on outyear projections. The outyear estimates include budget proposals and amounts that reflect congressional appropriations, apportionment, and reprogramming decisions at the time of the survey, but are in advance of final data on authorizations, obligations, or outlays.

NSF collects data at a fine level of detail for both performers and funders of R&D, and encourages agencies and firms to report revisions in historical time series when appropriate. NSF reports both national and sectoral R&D expenditure data (e.g., Appendix table 4-4, *S&EI--96*) and Federal R&D obligations data (e.g., Appendix table 4-17, *S&EI--96*) because both of these series provide useful information at different levels of dissaggregation and periods in time.

There is no single survey of R&D activity in the United States. Rather, NSF sponsors a series of surveys to collect information on financial R&D resources in the various sectors of the U.S. economy--industry, Government, academia, and selected nonprofit organizations. These independent survey data are aggregated into R&D expenditure estimates (using survey data, and time series, analytical, and statistical models) so that the components of the R&D effort are placed in a national context, including data on: the national total of R&D expenditures; the sources of such funds; the sector performing the R&D.

NSF constructs national R&D expenditure totals primarily based on data reported by performers because they are in the best position to (i) indicate how much they spent in the actual conduct of R&D in a given year and (ii) identify the source of their funds. Performer reporting also reduces the possibility of double-counting and conforms to international standards and guidance. But before performer-reported survey data on Federal R&D expenditures are available from industry and academia, data collected by OMB and NSF from the funders of R&D are used to project R&D performance. When survey data from the performers subsequently are tabulated, these statistics replace the projections that were based on the funders' expectations. Details of the model, data sources, and estimating procedures are explained in NSF 92-330 and NSF 95-304.

Revisions in NSF Data

Data in *S&EI-93* reflected the best figures available in the summer/fall of 1993. Performers reported approximately $59 billion in Federal R&D support for 1991 (see Appendix table 4-4, *S&EI--93*). Preliminary and projected estimates for 1992 and 1993 were in part based on the Administration's 1993 budget proposal. Federal agencies reported to NSF and OMB 1992 R&D support levels of $61 billion to $66 billion--depending on when the estimates were supplied and whether authorizations, obligations, or outlays were being measured--and expected increases ranging between $2 billion and $9 billion.

Data in *S&EI-96* reflect the best figures available in the summer/fall of 1995. In contrast to the prospective growth reported by Federal funders of R&D, performers reported receiving and spending much lower amounts: approximately $60 billion in Federal R&D for each year, 1991, 1992, and 1993 (see Appendix table 4-4, *S&EI--96*). The Federal amount to be reported by performers is projected to increase to approximately $61 billion for 1994 and 1995. NSF currently is investigating the reasons for the recent divergence in data series reported by Federal agencies whose reported numbers continue to rise, and by the organizations that actually perform the R&D, whose reported numbers remain rather level.

The difference in the Federal R&D data totals appears to be concentrated in funding of industry by the Department of Defense (DOD). Industrial firms report, for calendar year 1993, $15 billion in R&D performance funded by contracts and grants from the DOD. This figure is almost $9 billion less than the R&D amount reported by DOD to have been obligated to industrial firms in fiscal year 1993 ($24 billion). The DOD-reported total includes industry funding from its full research, development, test, and evaluation budget. Performer-based and funder-based data have always differed somewhat. However, over the last few years, this difference has increased. NSF is continuing to work with DOD and the US Bureau of the Census (which conducts the survey of industrial R&D for NSF) to review these R&D data and estimates in order to verify and better understand the trends and changes that underlie them. Reports on these topics will be issued later in 1996.

The U.S. National R&D system is in a period of major transition. NSF continues to monitor the changes occurring in the Nation's R&D effort, and to examine ways to improve our data collection and analyses efforts. Reports on these topics will be issued in the future. The reader is invited to contact the NSF for recent data and reports at 703-306-1780, or at our world wide web address at http://www.nsf.gov/sbe/srs/stats.htm.